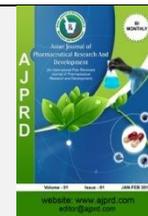


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Research Article

## Effectiveness of Red Betel (*Piper crocatum*) Leaf Ethanol Extract Mouthwash in Reducing Dental Plaque Index

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### ABSTRACT

**Objectives:** The purpose of this research was to determine the difference in the effectiveness of mouthwash of red betel leaf extract on the dental plaque index.

**Design:** This research design is Quasi experimental. The ethanol extract of red betel leaf was prepared in various concentrations for use by the correspondents as a mouthwash. Dental plaque was observed before and after treatment, then compared the differences in results between groups.

**Interventions:** The intervention variable in this study was a mouthwash preparation containing 4% and 5% ethanol extract of red betel leaf, then compared with a positive control mouthwash preparation containing Chlorhexidine.

**Main outcome measure:** The results showed a decrease in the dental plaque index in the correspondents who were given mouthwash containing 4% and 5% red betel leaf ethanol extract. The anova test showed a significant difference between the dental plaque index between before and after treatment ( $p \leq 0.05$ ).

**Conclusion:** Mouthwash containing ethanol extract of red betel leaves is effective in reducing the dental plaque index value.

**Keywords:** Dental plaque, mouthwash, *Piper crocatum*

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### INTRODUCTION

Dental plaque is a soft, non-mineralized deposit that is formed from a mixture of extracellular matrix, inorganic components, food debris and bacteria that adhere to the surface of a tooth or a denture<sup>1</sup>. Dental plaque contains bacteria that are able to colonize by itself. One of the bacteria that causes the formation of plaque is *Streptococcus mutans* which is able to ferment carbohydrates into acids, resulting in dental caries and periodontal disease. Both of these diseases can be prevented by controlling plaque on the surface of the teeth<sup>2,3</sup>.

The formation of dental plaque should be avoided by maintaining healthy teeth and mouth, which should be done

as early as possible on a regular basis. Dental plaque cleaning can be done conventionally, traditionally or a combination of both. Conventionally, dental plaque cleaning can be done mechanically and chemically<sup>4</sup>. Mechanical plaque cleaning by brushing your teeth twice a day, namely in the morning before meals and at night before going to bed. Chemically cleaning plaque using synthetic chemicals, generally used in the form of a mouthwash (gargarisma). Mouthwashes that contain synthetic chemicals, generally have an antiseptic effect, can help control the growth of supragingival plaque<sup>5,6</sup>.

Traditionally, natural ingredients can be used to clean plaque, which have been used empirically for a long time, such as betel leaf (*Piper betle* Linn.) And others<sup>7</sup>. Betel leaf has been known for a long time as an ingredient for

chewing, besides that betel leaf is also used for gargling which is believed to strengthen teeth, cure mouth sores, eliminate bad breath, and stop bleeding in the gums<sup>8</sup>. In this study, red betel leaf was used as an active ingredient in mouthwash which is expected to reduce the amount of dental plaque.

## MATERIALS AND METHODS

This type of research used in this research is research with Quasi Experimental design. In this research design intervention gargling red betel leaf extract and Chlorhexidine then measured the plaque index before and after the intervention.

In this study, the sample consisted of 105 subjects, who were divided randomly (simple random sampling) using a random number table, and divided into 3 groups of 35 respondents.

1. Group I: The control group gargled with chlorhexidin solution
2. Group II: The treatment group gargled with leaf extract 4% red betel
3. Group III: The treatment group gargled with leaf extract 5% red betel

The research instrument used in this study was the plaque index according to Loe and Sillness by assessing the thickness of the plaque on the cervical edges of the teeth near the gingiva and examining the teeth 1.6, 1.1, 2.6, 3.6, 3.1, and 4.6 while the surface of the teeth being examined, namely buccal, lingual / palatal, mesial and distal.

The criteria for assessing the dental plaque index according to Loe and Sillness are as follows:

1. Value 0 = No plaque on the gingival margin
2. Value 1 = There is a thin layer of plaque attached to the gingival margin in the area adjacent to the neighboring teeth, known by using a sonde by scratching the sonde.
3. Value 2 = There is a moderate pile of soft deposits in the gingival pocket and on the gingival margin or on the surface of the neighboring teeth which can be seen directly
4. Value 3 = There are many soft deposits in the gum pocket or on the margins and surfaces of neighboring teeth.

## Chemicals and Instruments

The materials used in this study were red betel leaf, disclosing solution, 96% ethanol, toothpaste, mouthwash, water and antiseptic cleanser. The tools used are sonde, mouth glass, tweezers, towels, kidney streams, toothbrush, mirror, measuring cup and stopwatch.

## Plant Extraction

The main sample material to be used is red betel leaf. In the preparation stage, the red leaves are washed and then dried. After the dry sorting stage the simplicia is ground using a grinding machine and sieved with a 40 mesh sieve, then stored in a dry and tightly closed place. The extraction of 2000 grams of red betel leaves was carried out maceration with 10 liters of 96% ethanol for 3 days. The extract

obtained was evaporated by the solvent with a rotary evaporator to obtain a thick extract<sup>9</sup>.

## Plaque Index Measurements

Plaque index measurements were carried out prior to treatment, using a disclosing agent on the teeth that had been determined according to the Loe and Sillness plaque index assessment criteria. The disclosing agent is given to the teeth by dropping it on the tip of the tongue and rubbing it on the tooth surface. This examination is determined as the initial palak score before rinsing with red betel leaf extract and gargling with plain water<sup>10,11</sup>.

Furthermore, subjects with the first and second groups were given 10 ml of betel leaf extract solution, and the third group was given 10 ml of water, the subjects were asked to rinse and leave it in the oral cavity for 30 seconds then discarded. After four hours, the plaque index was checked again.

## Data Analysis

The results of this study are displayed in the frequency distribution table. The statistical analysis used if the data is normally distributed (Saphiro Wilk test) is the one-way Anova test which aims to compare each parameter between the three intervention groups, while the dependent t test is to compare before and after the intervention in each group. Significance is indicated by p value  $\leq 0.05$  with a confidence level of 95%.

## RESULT AND DISCUSSION

The results showed that the distribution value of the difference in the accumulation of dental plaque before and after rinsing with red betel leaf extract can be seen in Table 1.

**Table: 1** Accumulation of dental plaque

Groups	Accumulation of Dental Plaque + SD			p Value
	Before	After	Difference Value	
Red Betel Leaf 4%	1.8986±0.62	1.1897±0.46	0.7089±0.25	0.000
Red Betel Leaf 5%	1.9006±0.62	1.1103±0.46	0.7903±0.29	0.000
Chlorhexidine	1.9096±0.66	0.7143±0.54	1.1926±0.45	0.000

Based on the table above, it is known that the decrease in dental plaque accumulation after gargling with red betel leaf extract with a concentration of 4% and 5% are 0.70886 and 0.79029 with a value of p = 0.000. Since the p value (0.000) < 0.05, it can be concluded that the red betel leaf extract with a concentration of 4% is effective in reducing the accumulation of dental plaque. Likewise, the decrease in the accumulation of dental plaque after gargling with chlorhexidine was 1.19257 with a value of p = 0.000. Since p value (0.000) < 0.05.

After being given treatment to the group that gargled with red betel leaf extract and chlorhexidine, it was found that it can significantly reduce the growth of *Streptococcus mutans* bacteria in saliva. The solution that comes into contact with the bacteria on the tooth surface will mix with saliva so that it can reduce the formation of acid in dental plaque<sup>12-14</sup>.

The betel leaf extract shows good antibacterial activity which can inhibit the growth of *Streptococcus mutans*, essential oil is a component of natural phenols, so it acts as a strong antiseptic. This compound is bactericidal and inhibits the glycolization process by glucan-producing cariogenic bacteria which can reduce the formation of dental plaque<sup>15,16</sup>.

## CONCLUSION

The results of this study indicate the effectiveness of using mouthwash containing red betel leaf extract in reducing the accumulation of plaque on teeth.

## REFERENCES

- Rosan B and Lamont RJ. Dental Plaque Formation. Microbe and Infection. 2000; 2(13):1599-1607.
- Marsh PD. Microbial Ecology of Dental Plaque and its Significance in Health and Disease. Advances in Dental Research. 1994;8(2):263-271.
- Marsh PD. Dental Plaque as a Microbial Biofilm. Caries Research. 2004;38:204-211.
- Warren PR and Chater BV. An Overview of Established Interdental Cleaning Methods. J Clin Dent. 1996; 9238867.
- Crocombe LA, Brennan DS, Slade GD and Loc DO. Is Self Interdental Cleaning Associated with Dental Plaque Level, Dental Calculus, Gingivitis and Periodontal Disease? Journal of Periodontal Research. 2012; 47(2):188-197.
- Matsui M, Chosa N, Shimoyama Y, Minami K, Kimura S and Kishi M. Effects of Tongue Cleaning on Bacterial Flora in Tongue Coating and Dental Plaque: a Crossover Study. BMC Oral Health. 2014; 14(4).
- Nugroho JJ and Hafsari WR. The Effectiveness of Betel Leaf (*Piper betle* Linn) extract Gel and Cocoa Bean (*Theobroma cacao* L) Extract Gel Application Against the Hardness of Enamel Surface In Vitro. Journal of Dentomaxillofacial Science. 2017; 2(1):23-27.
- Dasgupta N and Bratati D. Antioxidant Activity of Piper betle L. Leaf Extract in Vitro. Food Chemistry. 2004; 88(2): 219-224.
- Azwanida N. A Review on the Extraction Methods Use in Medicinal Plant, Principle, Strength and Limitation. Med Aromat Plants. 2015; 4(3): 1-6.
- Spliech CH and Nourallah AW. An Occlusal Plaque Index Measurements of Repeatability, Reproducibility, and Sensitivity. American Journal of Dentistry. 2006; 19(3): 135-137.
- Fischman SL. Clinical Index System Used to Assess the Efficacy of Mouth-Rinses on Plaque and Gingivitis. Journal of Clinical Periodontology. 1988; 15(8): 506-510.
- Ferrazzano GF, Amato I, Ingenito A, Zarrelli A, Pinto G and A Pollio. Plant Polyphenols and Their Anti-Cariogenic Properties: A Review. Molecules. 2011; 16(2): 1486-1507.
- Taechowisan T, Sitthipanya A, Wanbanjob A and Tantiwachwuttikul. Streptomyces sp. ST8 Extracts Attenuate Growth, Acid Production, Adhesion, Biofilm Formation, and Water Insoluble Glucan Synthesis of *Streptococcus mutans*. Microbial Ecology in Health and Disease. 2009; 21(2): 78-86.
- Phumat P, Khongkhunthian S, Wanachantararak P and Okonogi S. Comparative Inhibitory Effect of 4-allylpyrocatechol Isolated from Piper betle on *Streptococcus intermedius*, *Streptococcus mutans*, and *Candida albicans*. Archives of Oral Biology. 2020; 113: 104690.
- Madhumita M, Guha P and Nag A. Extraction of Betel Leaves (*Piper betle* L.) Essential Oil and Its Bioactives Identification: Process Optimization, GC-MS Analysis and Anti-Microbial Activity. Industrial Crops and Products. 2019; 138(5): 111578.
- Madhumita M, Guha P and Nag A. Optimization of the Exhaustive Hydrodistillation Method in the Recovery of Essential Oil from Fresh and Cured Betel Leaves (*Piper betle* L.) using the Box-Behken Design. Journal of Food Processing and Preservation. 2019; 43(11): e14196.

*Lactobacillus caesal* and *Actinomyces viscosus*. Betel leaf

## CONFLICT OF INTEREST

All authors have nothing to declare.

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